four colors map theory generalized to 4-dir

Mode IA | Tout | Images | Vidéos | Shopping | Vidéos courtes | Web | Plus | Outils

Aperçu généré par IA

When generalizing the Four Color Theorem to 4 dimensions, the mathematical answer is surprising: **an infinite number of colors is required**. Mathematics Stack Exch… +1

In a strict topological sense, there is no strict 4-dimensional equivalent to the "Four Color" limit. The theorem relies on the physical constraints of a 2D surface (the plane) and regions sharing 1-dimensional boundaries (lines). Wikipedia +3

In 3 or more dimensions, spatial geometry allows for completely overlapping and intertwined constructs. Here is how the problem fundamentally shifts:

The Problem of Mutual Adjacency

In a 2D plane, the maximum number of regions that can all border each other is 4. However, in 3D and 4D space, you can construct an infinite number of intersecting shapes (such as long, twisted square columns) that all mutually touch one another. Mathematics Stack Exch… +1

Because *every* shape in the set touches *every other* shape, a unique color is needed for each region. Therefore, if you take an infinite set of objects in 4D space, you need an infinite number of colors. Mathematics Stack Exchange

The Core Geometric Limit

To make a map-coloring theory work in 4D, mathematicians change the rules to restrict how shapes are allowed to connect. Instead of arbitrary borders, they look at **vertices** and **faces** on a specific topological manifold (the boundary of a 4D shape mapped into 3D). MathOverflow

If you are looking at coloring solid polyhedra meeting face-to-face in 3D (which maps to analogous constructions in 4D), mathematicians have demonstrated related theorems. For instance, certain classes of 3D polyhedra can be colored such that no two glued face-to-face share a color using **4 or 5 colors**, depending on whether the structure forms a "pure simplicial complex". Reddit +1

Translating to Graph Theory

In mathematics, the Four Color Theorem is actually a statement about Planar Graphs (a network of points and lines that can be drawn on paper without its lines intersecting). Wikipedia +3

- **2D space:** Maps yield **planar graphs**, which can be colored with at most 4 colors.
- **3D & 4D space:** Graphs can cross in highly complex ways and "break out" of the 2D plane constraint. This yields non-planar graphs. The more dimensions you have, the more complex the graph embeddings become, requiring progressively higher—and eventually infinite—numbers of colors to resolve. Reddit +5

If you want, I can explain:

- How the theorem changes for **closed surfaces** like spheres or tori in 3D

Posez une question

Four color theorem - Wikipedia

In mathematics, the four color theorem, or the four color map theorem, states that no more than four colors are required to color ...

Wikipedia

Is there an analog of the Four Color Theorem in 3-Dimensions?

5 févr. 2022 — Alternative 3D Graph Generalizations: While the direct 3D analog is trivial, the concept can be generalized to linklessly embeddab...

Reddit

A generalized version of the 4 color map theorem

28 févr. 2025 — The 4 color map theorem states that any 2 dimensional map you could ever draw can be colored in with 4 or fewer colors. What we me...

Mathematics Stack Exchange

Wikipedia
https://en.wikipedia.org › wiki

Four color theorem

· Traduire cette page

In mathematics, the **four color** theorem, or the **four color map** theorem, states that no more than **four colors** are required to color the regions of any **map**

Mathematics Stack Exchange
https://math.stackexchange.com › ...

A generalized version of the 4 color map theorem

· Traduire cette page

28 févr. 2025 — The 4 color map theorem states that any 2 dimensional map you could ever draw can be colored in with 4 or fewer colors. What we mean by map here is a plane ...

1 réponse · Meilleure réponse: Write cr(G) for the crossing number of a graph G, defined to be the leas…

Four colour theorem in 3 **dimensions**? - Math Stack ... 3 réponses 14 mars 2015

4-Color Theorem on Surfaces - Math Stack Exchange 4 réponses 16 nov. 2011

Autres résultats pour math.stackexchange.com

McMaster University
https://math.mcmaster.ca › Schwartzentruber-BSc

To Four Colours and Beyond

PDF

par J Schwartzentruber · 2020 — **Map** colouring has been of interest to **map** makers **for** as long as **maps** have been around. It involves assigning each region of a **map** a **colour** ...

28 pages

NRICH
https://nrich.maths.org › articles

The Four Colour Theorem | NRICH

· Traduire cette page

1 févr. 2011 — The conjecture that any **map** could be coloured using only **four colours** first appeared in a letter from Augustus De Morgan (1806-1871), first ...

· Traduire cette page

MathOverflow
https://mathoverflow.net › genera...

Generalizations of the four-color theorem

7 déc. 2014 — The four color theorem asserts that every planar graph can be properly colored by four colors. The purpose of this question is to collect generalizations, ...
19 réponses · Meilleure réponse: One of the most important generalizations of the four color theorem i…

Representations of regular **maps** (**four color** theorem) 1 réponse 3 mai 2011
Is there anything similar to the **four color** theorem **for** 3 ... 1 réponse 7 oct. 2015
Autres résultats pour mathoverflow.net

Medium · Mathonymics
Plus de 10 mentions J'aime · il y a 9 mois

The Four Color Theorem - Mathonymics

The **Four Color** theorem states that “Any **map** can be colored using at most **four colors** such that no two adjacent regions (those sharing a common ...

ResearchGate
https://www.researchgate.net › 21...

Traduire cette page

(PDF) A Simple Proof of the Four-Color Theorem

A simpler proof of the **four color** theorem is presented. The proof was reached using a series of equivalent theorems. First the maximum number of edges of a ...

Celebratio Mathematica
https://celebratio.org › article

Traduire cette page

Haken — Four-Color Solution

Four-Color Theorem states that **four colors are always sufficient to color a planar map** so that no two neighboring countries are the same color. For the theorem ...

Cantor’s Paradise
https://www.cantorsparadise.com › ...

Traduire cette page

The Four-Color Theorem. Its Surreal Simplicity & Critical…

22 oct. 2019 — In graph-theoretic language, the **four color** theorem claims that the vertices of every planar graph can be colored with at most **four colors** ...

Recherches connexes :

Ten color theorem **Riemann Hypothesis**

Color wikipedia

1 2 3 4 5 6 7 8 9 10 Suivant

Les résultats sont personnalisés - Essayer sans personnalisation

Canada **H3T 1E8, Montréal, QC** - D'après vos adresses (maison) - Mettre à jour ma position

Aide Envoyer des commentaires Confidentialité Conditions d'utilisation